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Laid-Open Patent No. 57-208530. - - -

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(54) Title of the Invention :

Anti-Glare Mirror Device

(21) Application No. Sho 56/1981-93742

(22) Date of Application : June 19, 1981

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SPECIFICATION

1. Title of the Invention

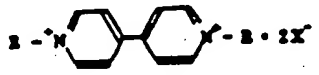
Anti-Glare Mirror Device

2. What we claim is :

An anti-glare mirror device characterized by the fact that it consists of a reflecting mirror formed by sealing an electrolytic solution prepared by dissolving an electro-chemically oxidizable and reducible organic substance in an inert solvent between transparent electrodes which are provided with transparent glass plates at the outer faces thereof and face each other, and by providing a highly reflecting surface on one of the above-mentioned transparent electrode facing each

other or one of the above-mentioned transparent glass plates facing each other and a drive circuit formed by providing a switch mechanism between the reflecting mirror and a drive power source by which to apply a voltage or a current to between the above-mentioned electrodes.

2. An anti-glare mirror device, in accordance with Claim 1, characterized by the fact that as the above-mentioned organic substance, use is made of a compound expressed by the following general formula,



(where R is a chain-like alkyl group having 4 to 9 carbon atoms, and X- indicates a negative ion), and as the inert solvent, use is made of an organic solvent with a relatively large dielectric constant such as N, N dimethyl formamide and acetonitrile or a mixture solvent thereof.

3. An anti-glare mirror device, in accordance with Claim 1, characterized by the fact that the above-mentioned drive circuit is provided with an electric quantity varying device.

3. Detailed Explanation of the Invention

The present invention relates to an anti-glare mirror device which prevents a driver from being dazzled by a light ray from head lights, etc. of a car following in the rear.

There have been formerly various types of such devices : for example, as shown in Fig. 1, 2 sheets of transparent glass plates a and a are allowed to face each other, liquid crystal e is placed between transparent electrodes b and b' provided respectively on the inner faces of the respective transparent glass plates a and a, a reflecting membrane is provided as a unitary body on the transparent electrode b' which is on the back side with respect to the incident light A out of the above-mentioned transparent electrodes, and in this manner, a reflecting mirror is formed.

The above-mentioned liquid crystal e is sealed in a frame body d adhered to the transparent electrodes b and b'.

This liquid crystal e is made in such a manner that when a voltage or a current is applied to between the above-mentioned transparent electrodes b and b', the incident light A may be diffused and thus the light transmissivity may be reduced.

The above-mentioned anti-glare mirror device is constituted in such a manner that the light transmissivity of the liquid crystal e may be reduced, and the reflection power may be thus reduced, and

consequently dazzling of a driver by the light ray from head lights of a car following in the rear may be prevented.

A conventional anti-glare mirror device as described above utilizes the light scattering effect of liquid crystal e as an anti-glare measure, however, with such a method, since a reflected image from the reflecting membrane provided as a unitary body with the transparent electrode b' is seen blurred, there is a problem in that the recognizability by seeing is extremely poor. In addition, there is a problem in that since an electrolytic effect type is used for the liquid crystal e, the liquid crystal may not be actuated unless a certain voltage or current is applied, and even if it is actuated, only uniform light transmissivity may be obtained. And therefore, there is a problem in that the reflection power as a reflecting mirror can not be varied in several types.

In view of the above-mentioned problem points, the present invention is to provide an anti-glare mirror device for which the recognizability by seeing may be improved and the reflection power may be continuously varied.

In the following, we shall explain the detail of the present invention by referring to Fig. 2 through Fig. 8. Fig. 2 through Fig. 6 show a first example of an anti-

glare mirror device in accordance with the present invention.

As shown in Fig. 2, the anti-glare mirror device in accordance with the present invention consists of a reflecting mirror 1 and a drive circuit 2 which has a switch mechanism which provide an input from a power source 22 to this reflecting mirror 1.

As shown in Fig. 3 and Fig. 4, the above-mentioned reflecting mirror 1 is constituted by allowing 2 sheets of transparent glass plates 11 and 11 to face each other, and by depositing transparent electrodes 12 and 12' on the whole inner faces of the respective transparent glass plates 11 and 11.

Lead wires 17 and 17' are connected to the respective transparent electrodes 12 and 12' and the lead wires are connected to the above-mentioned switch mechanism 21.

In addition, a frame body 15 made of a transparent glass material, etc. is adhered to between the transparent electrodes 12 and 12', and an electrolytic solution 14 is sealed in the said frame body 15. A reflecting membrane is formed as a unified body on the transparent electrode 12' which is at the back side with respect to the incident light A out of the above-mentioned transparent electrodes 12 and 12', thereby forming the reflecting mirror 1. Or as shown in Fig. 5, it is permissible to deposit the transparent electrode 12 on

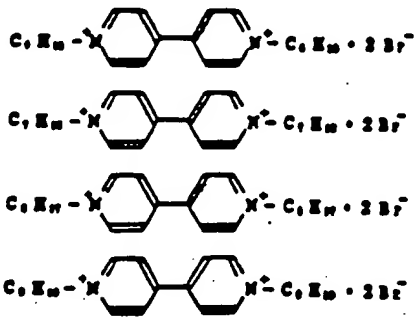
the inner face of the transparent glass plate 11 on the back side and to deposit a reflecting membrane 16 on the outer face thereof. In Fig. 3, 15a denotes a pouring opening for electrolytic solution.

The above-mentioned electrolytic solution 14 is the one prepared by dissolving in an inert solvent an organic substance which is electro-chemically oxidizable and reducible. And this electrolytic solution 14 is prepared in such a manner that though transparent in a normal state, it may develop color when a voltage or a current is applied to the transparent electrodes 12 and 12' and the coloring density may vary depending on the electric quantity, thereby making it possible to reduce the light transmissivity thereof.

Let us describe this more concretely : the organic substance which constitutes the above-mentioned electrolytic solution 14 is a halogen compound of 1, 1'-dialkyl- 4, 4'- di-pyridinium, and the structural formula thereof is given below.

Here R is a chain-like alkyl group having 4 to 9 carbon atoms, and is, for example, C_4H_9 (butyl group), C_5H_{11} (pentyl group), C_6H_{13} (hexyl group), C_7H_{15} (heptyl group), C_8H_{17} (octyl group), and C_9H_{19} (nonyl group),

and X- indicates a negative ion such as Br- (bromine ion), Cl- (chlorine ion), and I- (iodine ion). Among them, those which show a favorable property to follow a change in electric quantity are those compounds which consist of a chain-like alkyl group/groups having 6, 7, 8 and 9 carbon atoms and a negative ion/ions of Br-, and specific examples are as follows.



In addition, as the above-mentioned inert solvent, use may be made of an organic solvent having a relatively high dielectric constant such as methanol, propanol, dimethyl sulfoxide, acetonitrile, and N, N-dimethyl formamide, and these organic solvents can be used either alone or by mixing them. And an electrolytic solution 14 prepared with any of the above-mentioned organic substance mentioned above and an inert solvent mentioned above is such that it may develop blue color by an electric signal.

The above-mentioned switch mechanism 21 of the drive circuit 2 may be the one which has an on- off function

like a push button, a snap and a slide, and it may be installed in a location where a driver may easily operate it, for example, in the neighborhood of a reflecting mirror attaching position and on an instrument panel.

The anti-glare mirror device in accordance with the present invention is constituted as mentioned above, and we shall discuss the actions and effects thereof in the following. At the time when the electrolytic solution 14 of the reflecting mirror 1 is in a transparent state, if the switch mechanism 24 is turned on and the power source 22 is allowed to input to the transparent electrodes 12 and 12' of the reflecting mirror 1, the electrolytic solution 14 undergoes a color development phenomenon (blue coloring) and as shown in Fig. 6, the coloring density increases. Therefore, since the light transmissivity of the electrolytic solution 14 decreases by the color development phenomenon, it is possible to reduce the light reflected from the reflecting mirror 1.

In addition, if the switch mechanism 2 is turned off from the above-mentioned reduced light condition, since the electrolytic solution undergoes a reversible reaction and rapidly returns to a transparent state, it is possible to maintain the high reflection power.

Fig. 7 and Fig. 8 show another example embodying the present invention. In this example embodying the present invention, an electric quantity (voltage or

current) varying device 23 is placed between the switch mechanism 21 and the power source 22 of the drive circuit 2, and by arbitrarily adjusting the electric quantity by the said electric quantity varying device 23, the light transmissivity of the electrolytic solution 14 may be varied continuously and without any stepwise change. That is, since there is a relative proportional relationship between the degree of the coloring density of the electrolytic solution and the electric quantity, the light transmissivity is reduced in correspondence to the electric quantity as shown in Fig. 8. As a result, the reflection power of the reflecting mirror 1 may be varied continuously and without any stepwise change. Therefore, reflection power which suites the sensation of a driver may be easily obtained.

As can be clearly seen from the examples embodying the present invention mentioned above, since the present invention is constituted in such a manner that an electrolytic solution may be prepared by dissolving an oxidizable and reducible organic substance in an inert solvent and the reflection power of the reflecting mirror may be varied by a color developing phenomenon in the electrolytic solution, a reflected image does not become blurred compared with the conventional one which uses liquid crystal, and a driver can confirm the rear view securely, thereby making it possible to greatly

improve the recognizability by seeing.

In addition, there is an advantage in that it is possible to continuously vary the reflection power without any stepwise change in correspondence to the electric quantity.

4. Simple Explanation of the Drawings

Fig. 1 is a cross sectional view which shows one example of a reflecting mirror in a conventional anti-glare mirror device, Fig. 2 is a block diagram which shows a first example of an anti-glare mirror device embodying the present invention, Fig. 3 is an obliquely seen view which shows a reflecting mirror in the anti-glare mirror device, Fig. 4 is a cross sectional view of the reflecting mirror, Fig. 5 is a cross sectional view which shows another example of a reflecting mirror, Fig. 6 is an explanatory drawing which shows a changing state of the light transmissivity of the reflecting mirror, Fig. 7 is a block diagram which shows another example of an anti-glare mirror device embodying the present invention, and Fig. 8 is an explanatory drawing which shows the relationship between the light transmissivity and the electric quantity.

1 is a reflecting mirror, 2 is a drive circuit, 21 is a switch mechanism, 22 is a power source, 11 is a transparent glass plate, 12 and 12' are transparent

electrodes, 14 is an electrolytic solution, and 16 is a reflecting membrane.

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Agent, Patent Agent : M. Akimoto

Fig. 1

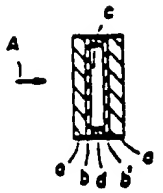
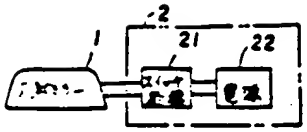


Fig. 2



key 1. reflecting mirror, 21. switch mechanism, 22. power source

Fig. 3

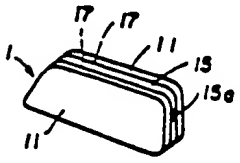


Fig. 4

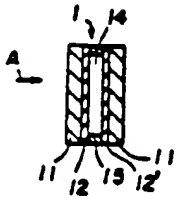


Fig. 5

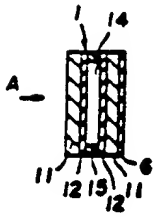
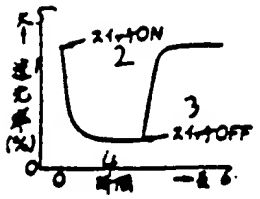
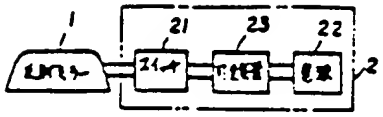


Fig. 6



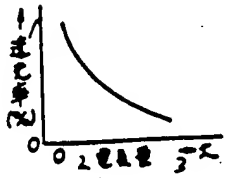
key 1. light transmissivity, 2 switch on, 3. switch off, 4. time 5. larger, 6. longer

Fig. 7



key 1 reflecting mirror, 21. switch, 22. power source, 23. varying device

Fig. 8



key 1. light transmissivity 2. electric quantity 3. larger

⑲ 日本国特許庁 (JP)　　⑪ 特許出願公開

⑫ 公開特許公報 (A)　　昭57—208530

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C 09 K 9/00		7229—4H

⑬公開　昭和57年(1982)12月21日

発明の数　1
審査請求　未請求

(全 4 頁)

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⑤防眩ミラー装置

⑳特　　願　昭56—93742
㉒出　　願　昭56(1981)6月19日

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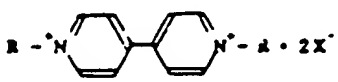
明　細　書

発明の名称　防眩ミラー装置

特許請求の範囲

1. 外面に透明ガラス板を備えた対向する透明電極間に、電気化学的に酸化還元可能な有機物質が不活性溶媒に溶解されている電解液を封入し、前記対向する透明ガラス板または透明電極の一方に高反射面を形成した反射ミラーと、前記電極間に電圧または電流を印加する駆動電源との間にスイッチ手段を設けてなる駆動回路とよりなることを特徴とする防眩ミラー装置。

2. 前記有機物質として、



(Rは4～9個の炭素原子を有する鎖状アルキル基、X^-は陰イオンを示す。)

で表わされる化合物を用い、不活性溶媒としてN，Nジメチルホルムアミド，アセトニトリル等の誘電率の比較的大きな有機溶媒またはこれらの混合溶媒を用いることを特徴とする特許請求の範囲第1項に記載の防眩ミラー装置。

3. 前記駆動回路に電流量可変装置を設けてなることを特徴とする特許請求の範囲第1項記載の防眩ミラー装置。

発明の詳細な説明

本発明は、後続車のヘッドランプ等の光線によって運転者が眩惑するのを防止すべくなした防眩ミラー装置に関するものである。

従来のこの種のものは色々あるが、例えば第1図に示すように、2枚の透明ガラス板a，bを対向させ、各透明ガラス板a，bの内面に設けた透明電極b，b'の間に液晶cを配設し、また、前記透明電極のうち、入射光Aに対して後方がわの透明電極b'に反射膜を一体に設け、これによつて反射ミラーを構成している。

前記液晶cは透明電極b，b'とに接触した枠体d内に封入されている。この液晶cは、前記透明電極b，b'とに電圧または電流を印加することにより、入射光Aを拡散させて透光率を減少できる

ようになつている。

前記防眩ミラー装置は、液晶eの透光率が減少することにより反射率を低下させ、これにより運転手が後続車のヘッドランプ光線によつて眩惑するのを防止できるようにしている。

ところで、上記に示す従来の防眩ミラー装置は、眩惑防止対策として、液晶eの光散乱効果を利用しているが、このような方法では、透明電極b'と一体に設けた反射膜からの反射像がにじんで見えるので、視認性が極めて悪い問題がある。また、液晶eは、電導効果型のものを用いているため、ある一定の電圧（または電流）を印加しないと、液晶を駆動させることが出来ず、また駆動しても一様の透光率しか得ることができないので反射ミラーとしての反射率を数種類に変更出来ない問題がある。

本発明は、上記の問題点に鑑み、視認性を向上させ、また反射率を連続的に変化することができるようにした防眩ミラー装置を提供せんとするものである。

以下、本発明の詳細を第2図乃至第8図について説明する。第2図乃至第6図は本発明による防眩ミラー装置の第1の実施例を示している。

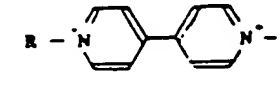
本発明による防眩ミラー装置は、第2図に示すように、反射ミラー1と、この反射ミラー1に電源22を入力させるスイッチ機構Sを有する駆動回路2とからなつている。

前記反射ミラー1は、第3図、第4図に示すように、2枚の透明ガラス板11、11'の内面全面に透明電極12、12'を形成させている。各透明電極には、一方にはリード線13、13'を接続し、そのリード線を前記スイッチ機構Sに接続させるようにしている。

また、透明電極12と12'との間に透明ガラステープからなるスペーサを介在し、筒体15内に後述する電解液14を封入させている。前記透明電極12、12'のうち、入射光Aに対して奥行がわの透明電極12'には反射膜16を全面に形成することにより反射ミラー1を構成している。或は、第5図に示すように、後方がわの透明ガラス板11'の内面に透明電極12'を、かつその外面に反射膜16を夫々形成させても良い。なお、第3図において15aは電解液注入口である。

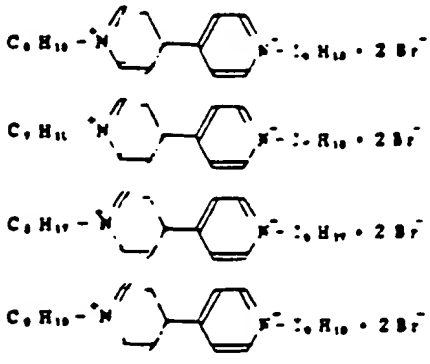
前記電解液14は、電気化学的に酸化還元可能な有機物質が不活性溶媒に溶解されたものである。そしてこの電解液14は、常態では透明であるが、透明電極12及び12'に電圧または電流を印加することにより発色すると共に、その発色濃度が電気量に対応して変化することにより透光率を減少できるようになつている。

具体的に述べると、前記電解液14を構成する有機物質としては、1，1'－ジアルキル－4，4'－ジピリジニウムのハロゲン化合物であり、その構造式を下記に示す。



……(1)

但し、Rは4～9個の炭素原子を有する鎖状アルキル基、例えば、C_4H_9（ブチル基），C_5H_{11}（ペンチル基），C_6H_{13}（ヘキシル基），C_7H_{15}（ヘプチル基），C_8H_{17}（オクチル基），C_9H_{19}（ノニル基）であり、X^-はBr^-（臭素イオン），Cl^-（塩素イオン），I^-（ヨウ素イオン）などの陰イオンを表わしている。これらの中で、電気量の変化に良好な追従性を示すもの、特に6，7，9個の炭素原子を有するアルキル基と、Br^-の陰イオンとからなる化合物が好ましく、これを具体的に示すと下記のとおりである。



また、前記の有機溶媒としては、誘電率が比較的大きな溶媒、例えばメタノール，プロパノー

ノナデルヌルホモレド，アセトエトリル，N，N ジノナデルホルムアミドなどを用いるが、これらの有機溶媒を単一若しくは混合させて用いても良い。そして、上記の何れかの有機物質と不活性溶媒とによつて生成された電解液14は電気信号によつて青色に発色するようになつている。

前記駆動回路2のスイツチ機構21は、押釦，スナツプ，スライドなどのようなオンーオフの切換機能を有するもので良く、また運転者が操作しやすいところ、例えば反射ミラー取付位置の近くやインストルメントパネルに設置される。

本発明の防眩ミラー装置は、上記の如き構成よりなるので、次にその作用効果を述べる。反射ミラー1の電解液14が透明状態にある時、スイツチ機構21をオンして電極22を反射ミラー1の透明電極12，12′に入力させると、電解液14は、酸化還元反応を起こすが、その還元反応のときに発色（青色）現象が生じて、第6図に示すように発色濃度が高まる。従つて、発色現象によつて電解液14の透光率が減少するので、反射ミラー1からの反射光を減光させることができる。

また、前記の減光状態からスイツチ機構21をオフさせると、電解液14は可逆反応が起こつて速やかに透明状態に戻るので、高い反射率を維持することができる。

第7図及び第8図は本発明による他の実施例を示している。この実施例は駆動回路2のスイツチ機構21と電極22との間に、電気量（電圧または電流）可変装置23を介装させ、該電気量可変装置23によつて電気量を任意に調節することにより、電解液14の透光率を無段階に変更できるようになつている。即ち、電解液の発色濃度の度合と電気量とが相対的な比例関係にあるので、第8図に示すように電気量に応じて透光率が減少する。その結果反射ミラー1の反射率を無段階にかつ連続的に変更させることができる。従つて、運転者の感覚に対応した反射率を容易に得ることができる。

以上の実施例より明らかなように、本発明は、酸化還元可能な有機物質を不活性溶媒に溶解させて電解液を生成し、この電解液の発色現象を利用して反射率を変更できるように構成したので、従来のような液晶を用いたものと比較して、反射像がにじむことが全くなくなり、運転者に対して防眩機能を保持し乍ら後方の確認を行うことができて、視認性を大巾に向上させることができる。しかも反射率を電気量に応じて無段階にかつ連続的に変更できる利点がある。

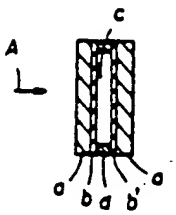
図面の簡単な説明

第1図は従来の防眩ミラー装置における反射ミラーの一例を示す断面図、第2図は本発明による防眩ミラー装置の第1の実施例を示すブロック図、第3図は防眩ミラー装置における反射ミラーを示す斜視図、第4図は反射ミラーの断面図、第5図は反射ミラーの他の例を示す断面図、第6図は反射ミラーの透光率の変化状態を示す説明図、第7図は本発明による防眩ミラー装置の他の実施例を示すブロック図、第8図は透光率と電気量との関係を示す説明図である。

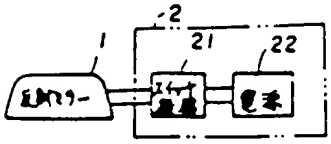
1…反射ミラー、2…駆動回路、21…スイツチ機構、22…電極、23…電気量可変装置、11…透明ガラス、12，12′…透明電極、14…電解液、16…反射膜。

特許出願人　市光工業株式会社
代理人弁理士　秋　本　正　実

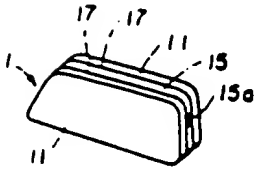
第 1 図



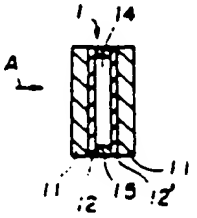
第 2 図



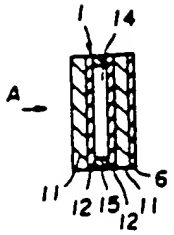
第 3 図



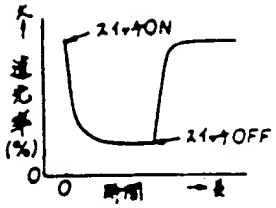
第 4 図



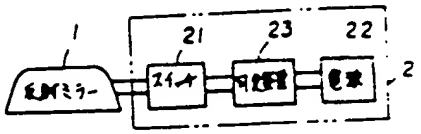
第 5 図



第 6 図



第 7 図



第 8 図